

Work Order ID 77538

December-13-1 8:38:15 AM

77538

Page 1

Item ID: D212-664-201

Accept

N900040100

Setup Start

NS1

Revision ID:

Item Name: Crosstube Aft

Stop

NS2

Start Date 13/12/2011 Start Qty: 1.00

1

Cust Item ID:

Require Date: 02/01/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: M.L.J

Date: 11/12/13 Tooling: _____ Date: _____

Run Start

NR1

QC: _____

Date: _____ SPC (Y/N): _____ Date: _____

Stop

NR2

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
D212-664-241	Rev D (DEO)
DSI9563	A

100 *100* DOCUMENT CONTROL sf 0.00

DC Memo 0.00

Document Control Photocopy bluefile and create labels as per PPP D212-664-201 CHG005 8.2.03/05

110 *110* Pick Kit 0.00

Packaging Packaging Memo 0.00

Packaging Memo 0.00

MO

12/2/21

Pto →

W/O: 77538

WORK ORDER CHANGES

DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approv Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D212-664-201 PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
12-02-21	120	CRUSHNG. IS over tol. R.C. Process	P 12-02-21 PS1042	Acceptable per attached SR	WA	S 12-02-28	P 12-02-21 PS1042	S 12-02-28

NOTE: Date & initial all entries

Work Order ID 77538

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Item ID: D212-664-201

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N900040100

Setup Start

NS1

Revision ID:

Item Name: Crosstube Aft

Stop

NS2

Start Date: 13/12/2011 **Start Qty:** 1.00 ***1***

Cust Item ID:

Required Date: 02/01/2012 **Req'd Qty:** 1.00 ***1***

Customer:

Reference:

Approvals:	Process Plan: _____	Date: _____	Tooling: _____	Date: _____	Run	Start	*NR1*
	QC: _____	Date: _____	SPC (Y/N): _____	Date: _____	Stop		*NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
120 *120* CNC Bend 2	BENDING MACHINE - CROSSTUBES	0.00	JW						12-2-21
CNC Alpha 160 Bender	Memo	0.00							
	Bend tube as per Dwg D212-664-241 using CNC bender program 212-aft								
130 *130* QC Quality Control	QC15- Crosstube Dimensional Check	0.00	JP						12-02-21
	Memo	0.00							

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval: Chief Eng / Prod Mgr	Approval: QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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Setup Start

NS1

Revision ID:

Item Name: Crosstube Aft

Stop ***NS2***

Start Date: 13/12/2011 **Start Qty:** 1.00

1

Cust Item ID:

Required Date: 02/01/2012 **Req'd Qty:** 1.00

1

Customer:

Reference:

Approvals: Process Plan:

Date:

Tooling:

Date:

Run Start

NR1

QC:

Date:

SPC (Y/N):

Date:

Stop

NR2

**Sequence ID/
Work Center ID**

140

140

Crosstubes

**Operation
Description**

Crosstubes

**Set Up/
Run Hours**

0.00

Tool ID

Tool #

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

0.00

Memo
1-Drill pilot holes in tube as per Dwg D212-664-241 using drill Jig DT8550, DT8551, drill table DT8577 and locate tower holes #8 as per QSI0010.

2-Ream hole to finish size in tube as per Dwg D212-664-241 using drill Jig DT8550 & DT8551. Check dimensions between holes, both sides on both cuffs, to ensure alignment with saddle holes.

3-Scribe part # and batch # using vibrating stylus as per Dwg D212-664-241

4-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D212-664-241

JW
MO

12-2-22

RJ

12-2-23

150

Crosstubes Chemical Conversion

0.00

Memo

0.00

Chemical Conversion Coat as within 24 hours of bending and drilling

RJ

12-2-23

150

HandFXtube

Hand Finishing Crosstubes

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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Start Date: 13/12/2011 **Start Qty:** 1.00

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Reference:

Approvals:	Process Plan: _____	Date: _____	Tooling: _____	Date: _____	Run	Start	*NR1*
	QC: _____	Date: _____	SPC (Y/N): _____	Date: _____	Stop	*NR2*	

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
160 *160* QC Quality Control	QC3- Inspect Part Finish Memo	0.00 0.00							<i>ml 12 02 23(1)</i>
170 *170* QC Quality Control	QC5- Inspect part completeness to step on W/O Memo	0.00 0.00							<i>ml 12 02 23(1)</i>
180 *180* Outsource2 Outsource process - NDT	Outsource process - NDT per QSI038 4.1 Memo Liquid Penetrant Inspection as per QSI 038 Issue P/O: <i>16287</i> LPI as per ASTM 1417 Level 2 Attach copy of NDT results to work order	0.00 0.00							<i>ml 12 02 27</i>

W/O:		WORK ORDER CHANGES							
DATE	STEP	PROCEDURE CHANGE			By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

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Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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Item Name: Crosstube Aft

Stop

NS2

Start Date: 13/12/2011 **Start Qty:** 1.00

1

Cust Item ID:

Required Date: 02/01/2012 **Req'd Qty:** 1.00

1

Customer:

Reference:

Approvals: **Process Plan:** _____

Date: _____

Tooling: _____

Date: _____

Run Start

NR1

QC: _____

Date: _____

SPC (Y/N): _____

Date: _____

Stop

NR2

**Sequence ID/
Work Center ID**

**Operation
Description**

**Set Up/
Run Hours**

Tool ID

Tool #

**Plan
Code**

**Accept
Qty**

**Reject
Qty**

**Reject
Number**

**Insp.
Stamp**

190

Receive & Inspect for Damage & Mat'l Certs

0.00

190

Packaging

Memo

0.00

Packaging

Ensure copy of NDT results attached to work order.

200

QC5- Inspect part completeness to step on W/O

0.00

5/12/12

200

Memo

0.00

Quality Control

Inspect for damage & ensure results are as per Dwg D212-664-241

W/O:		WORK ORDER CHANGES							
DATE	STEP	PROCEDURE CHANGE			By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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Setup Start

NS1

Revision ID:

Item Name: Crosstube Aft

Stop

NS2

Start Date: 13/12/2011 Start Qty: 1.00

1

Cust Item ID:

Required Date: 02/01/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals:	Process Plan:	Date:	Tooling:	Date:	Run	Start	*NR1*
	QC:	Date:	SPC (Y/N):	Date:	Stop		*NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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210 Spray Painting per QSI005 4.2

0.00

Af 12 - 3 - 1

210

SprayPaint

Memo 0.00

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube as per DEO D212-667-241 with White Imron as per
QSI 005 4.2

PRIME:

Start Time: 9:15
Finish Time: 10:30

Af 12 - 2 - 29

PAINT:

Start Time: 8:30
Finish Time: 9:30

Af 12 - 3 - 1

220

QC14- Inspect Spray Paint

0.00

W 12 03 02 ①

220

QC

Quality Control

Memo 0.00

Then, Wrap in plastic bag to protect from scratches

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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Work Order ID 77538

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Item ID: D212-664-201

Accept

N900040100

Setup Start

NS1

Revision ID:

Item Name: Crosstube Aft

Stop

NS2

Start Date: 13/12/2011 **Start Qty:** 1.00

1

Cust Item ID:

Required Date: 02/01/2012 **Req'd Qty:** 1.00

1

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start

NR1

QC:

Date:

SPC (Y/N):

Date:

Stop

NR2

**Sequence ID/
Work Center ID**

**Operation
Description**

**Set Up/
Run Hours**

Tool ID

Tool #

**Plan
Code**

**Accept
Qty**

**Reject
Qty**

**Reject
Number**

**Insp.
Stamp**

230

230

Crosstubes

Crosstubes

0.00

0.00

A 12-3-5

Crosstubes

Memo

0.00

1-Abrade mating surfaces of support and crosstube with 400 grit sandpaper,
clean the area with 4105S wash 'n' wipe

2-Install supports with Proseal 890 per DS19563 and QSI 015

A/R Proseal 890 Batch: 120072

3-Install clamps as per Dwg D212-664-241. Torque clamps to 80-100 in lb.

240

QC5- Inspect part completeness to step on W/O

0.00

Snr303

240

QC

Quality Control

0.00

250

Pick Kit

0.00

250

Packaging

Memo

0.00

Packaging

12/3/11

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

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Work Order ID 77538

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77538

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Item ID: D212-664-201

Accept

N900040100

Setup Start

NS1

Revision ID:

Item Name: Crosstube Aft

Stop

NS2

Start Date: 13/12/2011 **Start Qty:** 1.00

1

Cust Item ID:

Required Date: 02/01/2012 **Req'd Qty:** 1.00

1

Customer:

Reference:

Approvals:	Process Plan: _____	Date: _____	Tooling: _____	Date: _____	Run	Start	*NR1*
	QC: _____	Date: _____	SPC (Y/N): _____	Date: _____	Stop		*NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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260 QC4- 100% Inspect kits for completeness

0.00

8/26/03/09

260

QC

Quality Control

270

270

Packaging

Packaging

0.00

Packaging

Memo

0.00

Tablet & 53

1x SP 12-03-09.

Rev H

280

280

QC

Quality Control

QC21- Final Inspection - Work Order Release

0.00

Memo

0.00

12/3/12 JJ

ME

12-08-09

W/O:		WORK ORDER CHANGES							
DATE	STEP	PROCEDURE CHANGE			By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

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Page 1

Work Order ID: 77538

77538

Parent Item: D212-664-201

D212-664-201

Parent Item Name: Crosstube Aft

Start Date: 13/12/2011

Required Date: 02/01/2012

Comments: IPP Rev:E04.02.16ReformatK/DS

IPP Rev:F 06-03-29 Remove Coments on Pick List JLM

IPP Rev:G 07-04-30 As per Rev C JLM

IPP Rev:H 08-05-22 up date Qty of rubber cushion DD verified by:EC

Start Qty: 1.00

Required Qty: 1.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
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D212-664-201TRNRevC		Manufactured	No	B73252		110	Each	0.0000	1	1	MO	12/2/21
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D212-664-201TRNRevC

Crosstube Turning Detail

D3595-063-530		Manufactured	No			230	Each	87.0000	2	2	A8	12-3-5
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D3595-063-530

RUBBER CUSHION

<u>Location</u>	<u>Loc Qty</u>	<u>Loc Code</u>
MAT052	87	
63407	6	
67185	6	
70067	18	
72745	16	
75783	41	

D2940-1		Manufactured	No			230	Each	17.0000	2	2	A8	12-3-5
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D2940-1

Support

<u>Location</u>	<u>Loc Qty</u>	<u>Loc Code</u>
LG	7	
74766	1	
76729	6	
LG052	10	
76729	10	

2

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

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Work Order ID: 77538

77538

Parent Item: D212-664-201

D212-664-201

Parent Item Name: Crosstube Aft

Start Date: 13/12/2011

Required Date: 02/01/2012

Start Qty: 1.00

Required Qty: 1.00

MS21920-28

Purchased No

230

Each

66.0000

4

4

**

A 12-3-5

MS21920-28

Clamp(per MIL-DTL-8783C)

	<u>Location</u>	<u>Loc Qty</u>	<u>Loc Code</u>
	FG	5	
	105884	5	
LG050	120054	61	4
	116839	2	
	118713	4	
	119285	5	
	119920	50	

D3428-1

Manufactured No

250

Each

26.0000

**

1 1
B7813

	<u>Location</u>	<u>Loc Qty</u>	<u>Loc Code</u>
	ST053	26	
	76508	26	

MS21042L6

Purchased No

250

Each

1,310.000

**

6 P

MS21042L6

Nut

	<u>Location</u>	<u>Loc Qty</u>	<u>Loc Code</u>
	ST300	1310	
	117677	25	
	118384	5	
	118927	48	
	118968	182	
	119075	1000	20
	119736	50	

AN960JD616

NAS1149D0663J Purchased

No

250

Each

0.0000

**

18 18
M19075

AN960JD616

Washer

W/O:		WORK ORDER CHANGES							
DATE	STEP	PROCEDURE CHANGE			By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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December-13-11 8:38:19 AM

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Work Order ID: 77538

77538

Parent Item: D212-664-201

D212-664-201

Parent Item Name: Crosstube Aft

Start Date: 13/12/2011

Required Date: 02/01/2012

Start Qty: 1.00

Required Qty: 1.00

AN6-40A

Purchased

No

250

Each

56.0000

4

4

**

SJ

AN6-40A

Bolt

<u>Location</u>	<u>Loc Qty</u>	<u>Loc Code</u>
ST342	56	
119449	6	
119749	50	

AN6-41A

Purchased

No

250

Each

35.0000

2

2
M120187

12/18 SJ

AN6-41A

Bolt

<u>Location</u>	<u>Loc Qty</u>	<u>Loc Code</u>
ST342	35	
119449	15	
119749	20	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

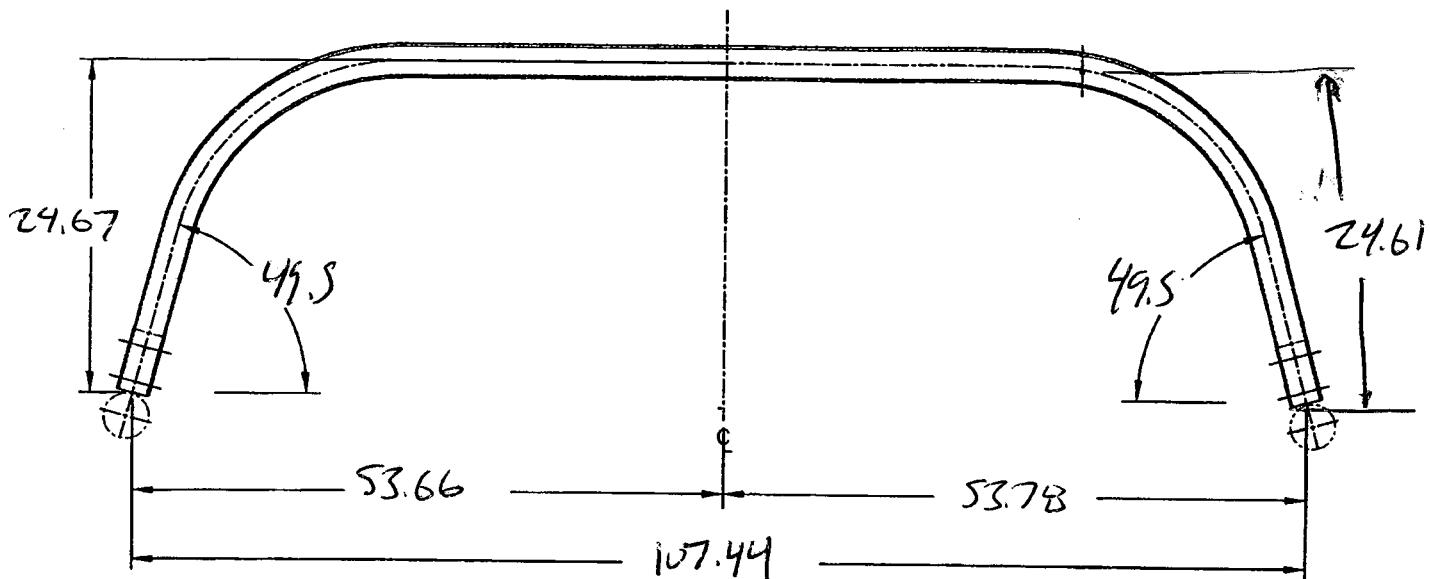
Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD	Work Order:	77538
Description: Crosstube High Aft (205/212)	Part Number:	D212-664-201
Inspection Dwg: D212-664-241	Rev: D	Page 1 of 1

Required Dimension	Min	Max
Height	24.17	24.43
1/2 Span	53.59	53.85
Angle	49	52
Total Span	107.18	107.70



Comments	
# PASSES A: 10	CRUSHING A: 7.0%
B: 13	B: 7.3%
Acceptable ASI 042 - (P 12.02.21)	
QC15 Inspection	(P 12.02.21)
Date	

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	07.05.08	Dimensions updated per Dwg rev. C	KJ/JLM	
C	10.04.01	Dwg Rev updated	KJ	J

W/O:		WORK ORDER CHANGES							
DATE	STEP	PROCEDURE CHANGE			By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

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NOTE: Date & initial all entries

8 7 6 5 4 3 2 1

D

D

C

B

A

Item	Qty -241	Qty -241B	Part Number	Description
1	X		D212-664-241	CROSSTUBE ASSEMBLY (205/212 HIGH AFT)
2	X		D212-664-241B	CROSSTUBE ASSEMBLY (214 HIGH AFT)
3	1	1	D6006-129	CROSSTUBE
4	2	2	D2940-1	SUPPORT
5	4	4	D3595-063-530	RUBBER CUSHION
6	4	4	MS21920-28	CLAMP (OR MS21920-30)
7	A/R	A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6006-129
FINISHED LENGTH = 124.362±0.020
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: SCRIBE DART PART NUMBER 'D212-664-XXX' AND BATCH NUMBER ON INSIDE OF CUFF USING VIBRATING STYLUS.
- 7) WEIGHT: D212-664-241 = 44.2 lbs (PER IIN-D212-664)
D212-664-241B = 44.2 lbs (PER IIN-D212-664)
- 8) PART IS SYMMETRIC ABOUT CENTERLINE.
- 9) RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALLY. TRANSITION SHOULD BE SMOOTH.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 5 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 11) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 12) INSTALL D2940-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2940-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 13) INSTALL MS21920-28 CLAMPS (OR -30) WITH D3595-063-530 RUBBER CUSHIONS TO SECURE THE D2940-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE OF CROSSTUBE SUPPORT.
- 14) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 15) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDERS

NO. 77538 M.C.J. b/w # II-614
11/12/1311/12/13 UNDER REVIEW
11/12/13

DEO ATTACHED

RELEASED
2009-10-29
M.Y.

D	REFORMAT/REVISE GENERAL NOTES/PART LIST; REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS; ADD -241B (ZN D4-2, B4-2); REMOVED REF & ADD TOLERANCES (ZN D8-3 & C4-3, C6-3 & A8-3); RELOCATED FLAG #6 PER PAR 08-046 (ZN A5-3); MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4	RF	09.09.30
C	REMOVE -1009 ABRASION STRIP; ADD MAGNOBOND 6398, CUSHION, REVERSE CLAMPS	PH	07.03.08
B	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	PH	05.02.04
A	NEW ISSUE	PH	00.12.12
REV.	DESCRIPTION	BY	DATE
DESIGN	P	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	RF	REV. D	
CHECKED	P	DRAWING NO. D212-664-241 SHEET 1 OF 4	
MFG. APPR.	D	TITLE CROSSTUBE ASSY (205/212 HI AFT) NTS	
APPROVED	P	SCALE	
DE APPR.	H	COPYRIGHT © 2000 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY OTHER PURPOSE OR DISCLOSED OR COPIED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD	
DATE	09.09.30		

8 7 6 5 4 3 2 1

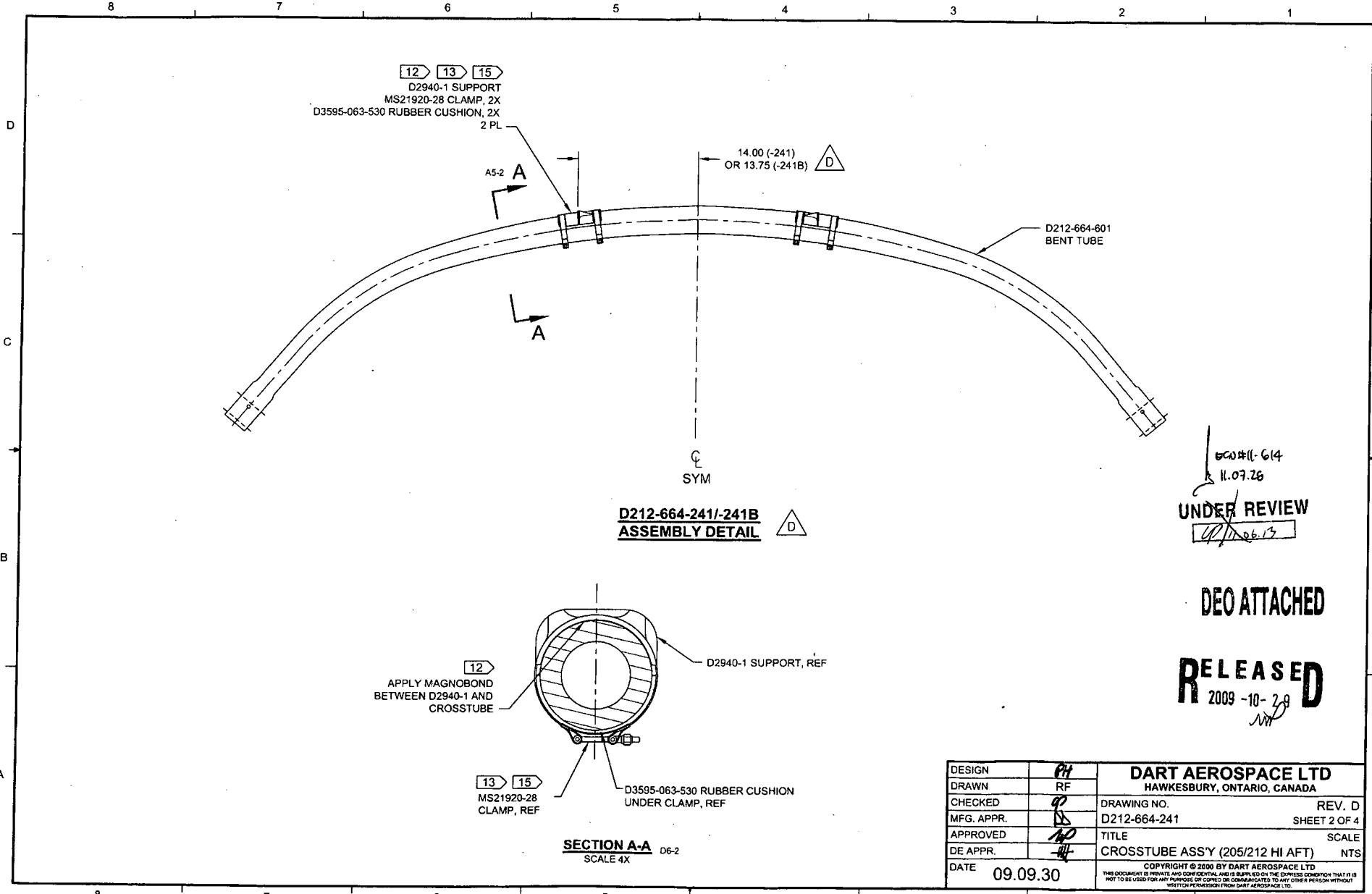
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

77538



DESIGN	PH	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA
DRAWN	RF	REV. D
CHECKED	PP	DRAWING NO. D212-664-241
MFG. APPR.	DS	SHEET 2 OF 4
APPROVED	AD	TITLE CROSSTUBE ASSY (205/212 HI AFT)
DE APPR.	MM	SCALE NTS
DATE	09.09.30	COPYRIGHT © 2000 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.

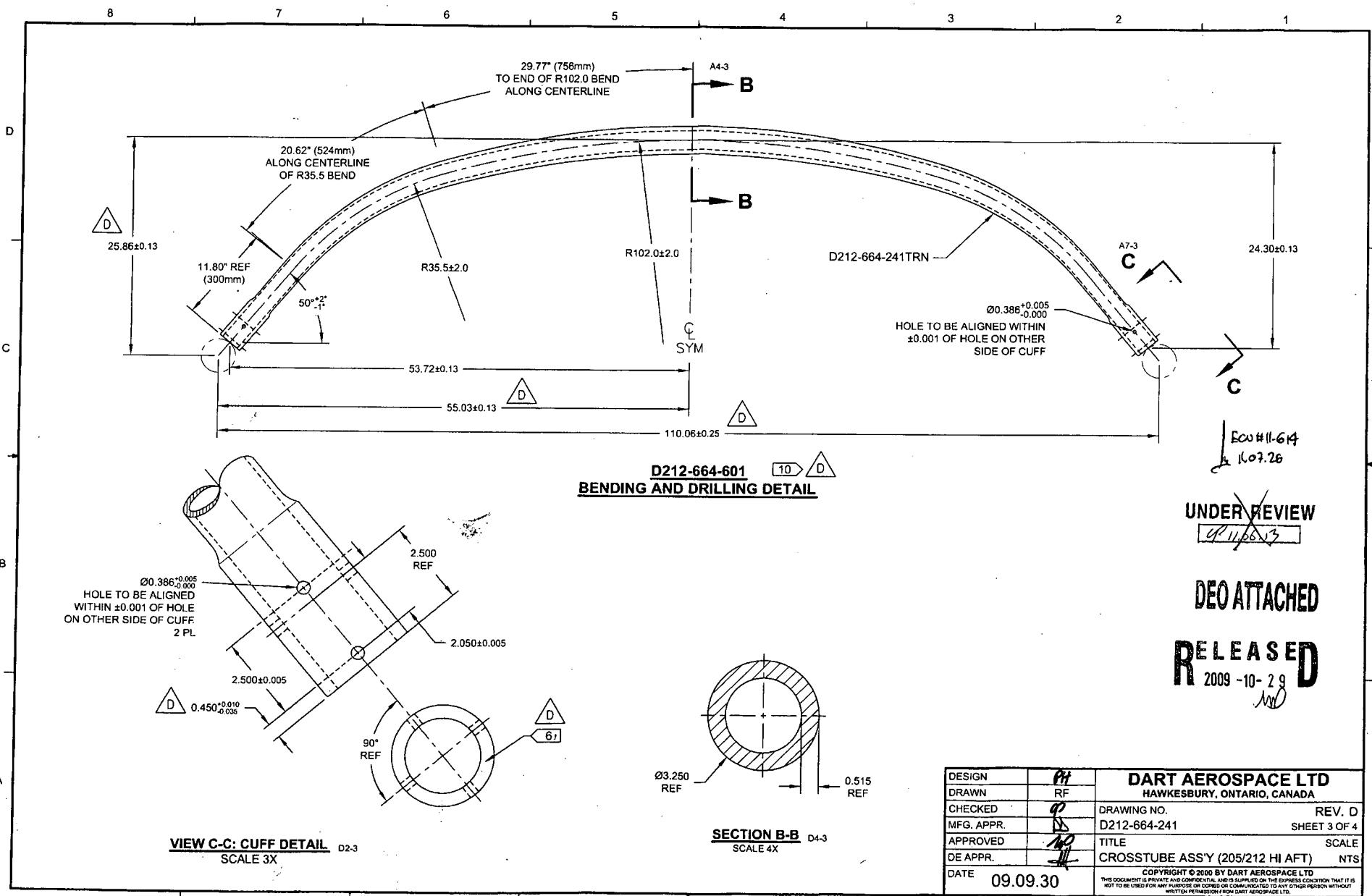
W/O:		WORK ORDER CHANGES							
DATE	STEP	PROCEDURE CHANGE			By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)							
DATE	STEP	Description of NC Section A	Corrective Action Section B				Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date				

NOTE: Date & initial all entries

677538



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

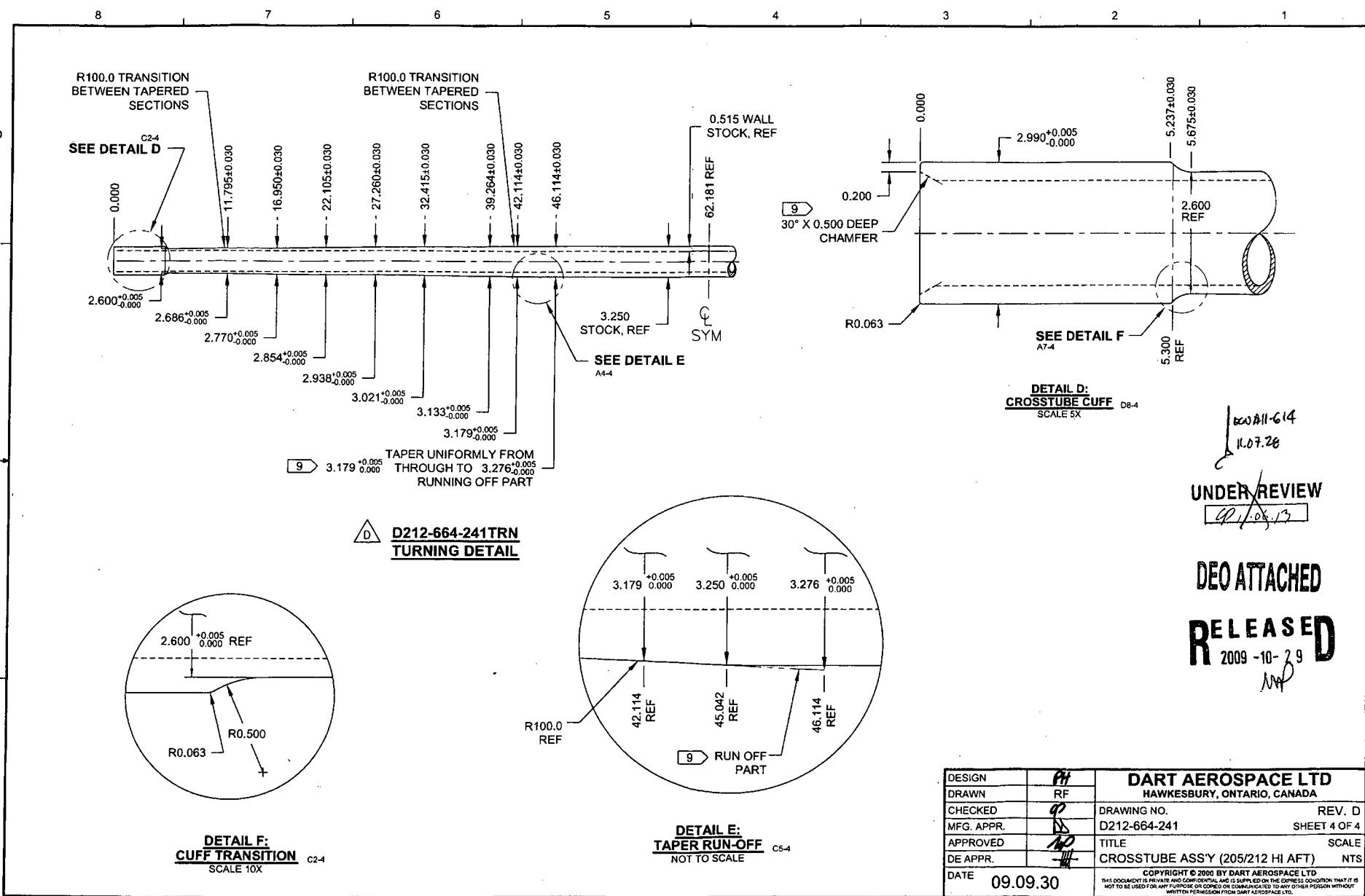
Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

77838



DESIGN	P4	DART AEROSPACE LTD
DRAWN	RF	HAWKSLEY, ONTARIO, CANADA
CHECKED	PP	DRAWING NO. REV. D
MFG. APPR.	VS	D212-664-241 SHEET 4 OF 4
APPROVED	ND	TITLE SCALE
DE APPR.	MM	CROSSTUBE ASSY (205/212 HI AFT) NTS
DATE	09.09.30	COPYRIGHT © 2000 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

77538

DRAWING NO. D212-664-241	TITLE CROSSTUBE ASSY (205/212 HI AFT)	REV. D	DART AEROSPACE LTD ENGINEERING ORDER	D.E.O. NO. D212-664-241-D-1	SHEET NO. SHEET 1 OF 2	SCALE NTS
DRAWN <i>✓</i>	CHECKED <i>IP</i>	MFG. APPR. <i>E</i>	APPROVED <i>MP</i>	DE APPR. <i>MP</i>		
DATE 11.04.07	DATE 11.04.11	DATE 11.04.12	DATE 11/04/12	DATE 11.04.12		

PURPOSE:

ADD AN INSPECTION WINDOW TO UNDERSIDE OF CROSSTUBE.

CHANGE:

NOTES 2 OF SHEET 1 IS AMENDED AS FOLLOWS:

IS:

2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
 PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
 MASK UNDERSIDE OF CROSSTUBE AS SHOWN (HATCHED AREA) AND
 PAINT OUTSIDE PER DART QSI 005 4.2
 REMOVE MASKING AND APPLY CLEAR COAT

RELEASED

2011-04-18

UNDER REVIEW

OP 11.06.13
 BCW/H-G14
 3.11.07.28

WAS:

2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
 PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
 PAINT OUTSIDE PER DART QSI 005 4.2

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

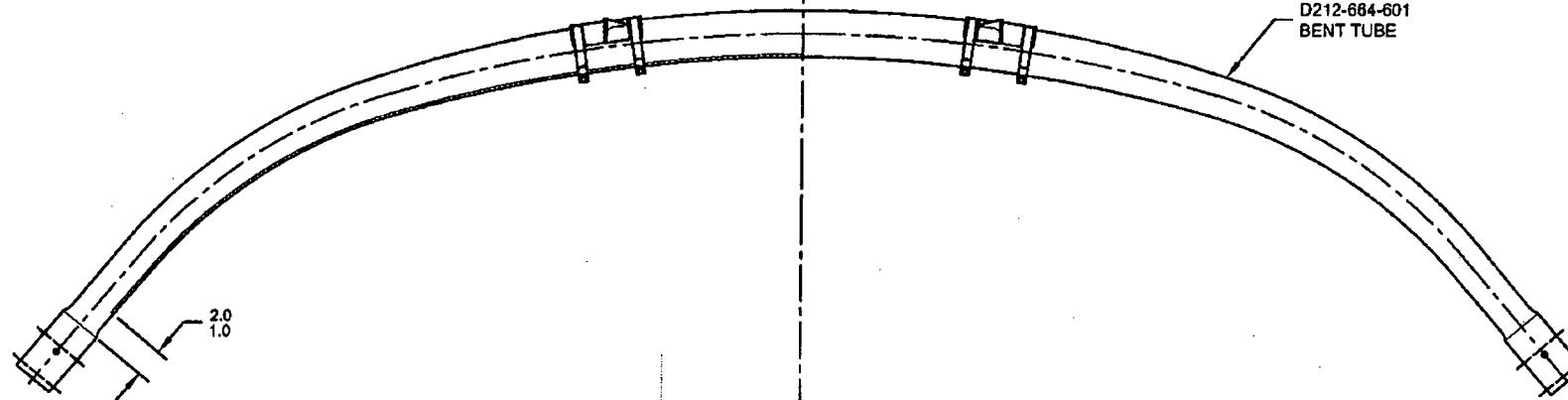
Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

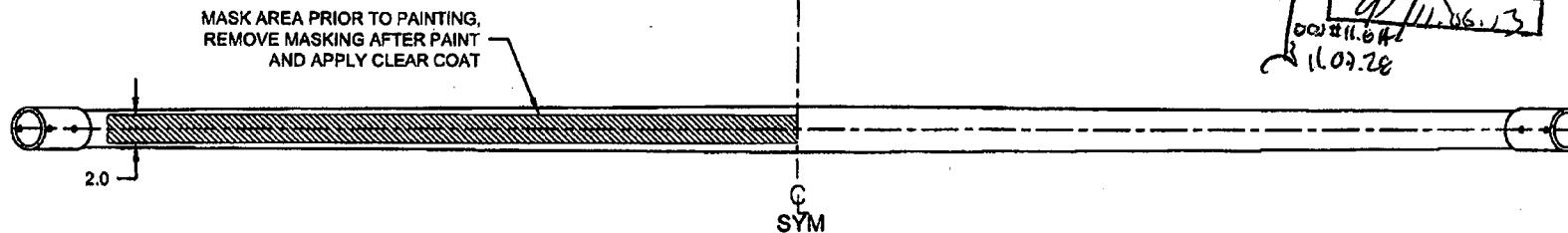
NOTE: Date & initial all entries

77538

DRAWING NO. D212-664-241	TITLE CROSSTUBE ASSY (205/212 HI AFT)	REV. D	DART AEROSPACE LTD ENGINEERING ORDER	D.E.O. NO. D212-664-241-D-1	SHEET NO. SHEET 2 OF 2	SCALE NTS
DRAWN DATE 11.04.07	CHECKED DATE 11.04.11	IP	MFG. APPR. B	APPROVED JWD	DE APPR. H	
			DATE 11.04.12	DATE 11.04.12	DATE 11.04.12	DATE 11.04.12

IS:WAS:D212-664-601
BENT TUBE

D212-664-241/-241B
ASSEMBLY DETAIL



RELEASED
2011-04-18
HJD

UNDER REVIEW
IP 11.06.13
DO 11.06.13
(L0) 28

W/O:		WORK ORDER CHANGES							
DATE	STEP	PROCEDURE CHANGE			By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

77538

DRAWING NO. D212-664-241	TITLE CROSSTUBE ASS'Y (205/212 HI AFT)	REV. D	DART AEROSPACE LTD ENGINEERING ORDER	D.E.O. NO. D212-664-241-D-2	SHEET NO. SHEET 1 OF 1	SCALE NTS
DRAWN <i>qp</i>	CHECKED <i>ASS</i>		MFG. APPR. <i>AS</i>	APPROVED <i>MM</i>	DE APPR. <i>MM</i>	
DATE 11.07.15	DATE 11.07.20		DATE 11.07.21	DATE 11.07.21	DATE 11.07.21	

PURPOSE:
REPLACE MAGNOBOND WITH PROSEAL.

CHANGE:**IS:**

Item	Qty -241	Qty -241B	Part Number	Description
7	A/R	A/R	PROSEAL 890 B-2	SEALANT, AMS-S-8802 CLASS B-2

WAS:

7	A/R	A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)
---	-----	-----	----------------	---

NOTE 12 & 15, SHEET 1 IS AMENDED AS FOLLOWS:

IS:

12) TO INSTALL D2940-1 SUPPORT: ABRADE MATING SURFACE OF SUPPORT AND CROSSTUBE WITH 180-GRT SANDPAPER AND REMOVE RESIDUE WITH MEK (OR EQUIVALENT). APPLY A 0.04" TO 0.07" THICK LAYER OF PROSEAL 890 CLASS B-2 (OR AMS-S-8802 CLASS B-2) SEALANT TO MATING SURFACE OF SUPPORT.

15) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER PROSEAL 890 SEALANT HAS CURED FOR 72 HOURS.

WAS:

12) INSTALL D2940-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2940-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.

15) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

RELEASED
2011-07-28
JKW

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

12-12-21

IS ALLOWABLE

CRUSHING. 8% CRUSHING AT END OF BEAM
The will fail if support before crack of 8%

$$MS = 14.32 / 11.65 - 1 = 0.22$$

$$A: F = M_c/I = P \times 13.5 \times 2.548 / 2 \times 1.476 = 11.65 P$$

$$B: P = 41.3 \times 2.992 / 2 \times 4.284 = 14.32 P$$

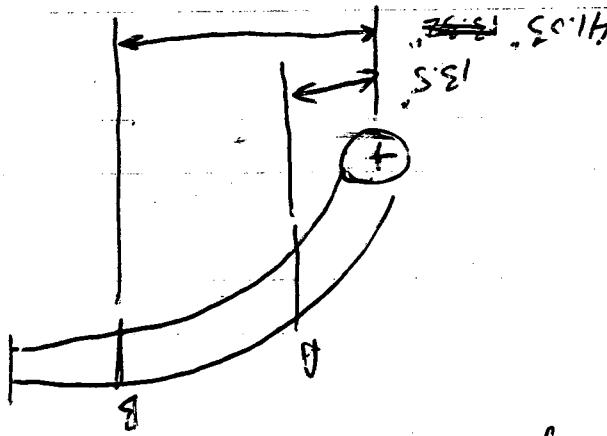
$$I = 4.284 \text{ in}^4$$

$$\text{Ans } B: O = 3.25 \text{ in. } I = 2.22 \text{ in.}$$

$$I = 1.476 \text{ in}^4$$

$$\text{CRUSHING } (2.992 - 2.548) / (2.992 + 2.548) = 8\%$$

$$\text{Ans } A: OI = 2.548 \text{ in. } OI2 = 2.442 \text{ in.}$$



Breaking load of 8% crushing

CRUSHING OF D212-664-201

5.0 PARTS LIST

5.1 HIGH GEAR CROSSTUBES

Item	-101	-201	-203	Part Number	Description
	X			D212-664-101	CROSSTUBE INSTALLATION, 204/205/210/212/214/412, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH FWD
		X		D212-664-201	CROSSTUBE INSTALLATION, 204/205/210/212/214, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH AFT
			X	D412-664-203	CROSSTUBE INSTALLATION, 412 HIGH AFT
1	1			D212-664-141	CROSSTUBE ASSEMBLY, 204/205/210/212/214/412, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH FWD
2		1		D212-664-241	CROSSTUBE ASSEMBLY, 204/205/210/212/214, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH AFT
3			1	D412-664-243	CROSSTUBE ASSEMBLY, 412 HIGH AFT
10	2			* D2893-1	SUPPORT
11	4			* D3595-063-450	RUBBER CUSHION
12	4			* MS21920-25	CLAMP (OR MS21042-26)
13	4			AN6-35A	BOLT
14	4			AN6-36A	BOLT
15	6			MS21042L6	NUT (OR MS21042-6)
16	18			AN960JD616	WASHER
20	2			* D2940-1	SUPPORT
21	4			* D3595-063-530	RUBBER CUSHION
22	4			* MS21920-28	CLAMP (OR MS21042-30)
23	/ 4			AN6-40A	BOLT
24	/ 2			AN6-41A	BOLT
25	/ 6			MS21042L6	NUT (OR MS21042-6)
26	/ 18			AN960JD616	WASHER
30			1	* D2896-1	SUPPORT
32			2	* D3595-063-570	RUBBER CUSHION
33			4	* MS21920-28	CLAMP
34			2	* MS21920-30	CLAMP (OR MS21042-32)
35			4	AN6-40A	BOLT
36			2	AN6-41A	BOLT
37			6	MS21042L6	NUT (OR MS21042-6)
38			18	AN960JD616	WASHER
39			2	* D3189-1	CHAFING SHIELD
50	1	/ 1		D3428-1	PLACARD

*REFERENCE ONLY. PARTS ARE INCLUDED IN D212-664-141/-241 OR D412-664-243 ASSEMBLIES ABOVE
 NOTE: KITS INCLUDE EXTRA HARDWARE FOR COMPATIBILITY WITH BOTH DART AND BELL/AAI
 SKIDTUBES.



LIQUID PENETRANT TEST REPORT

P- 14907

CLIENT	<u>Dart Aerospace</u>	DATE	<u>FEB 27-2002</u>	PAGE	<u>1</u> OF <u>1</u>
ATTENTION	<u>LINDA</u>	TIME	<u>AM <input checked="" type="checkbox"/> PM <input type="checkbox"/></u>	ACUREN JOB NO.	<u>185-12-20053</u>
ADDRESS	<u>1270 Aberdeen St</u>	PO/WO NO.	<u>-</u>	WORK LOCATION	<u>SANE</u>
PROJECT	<u>F.P.I. on cross tubes</u>				
ITEM(S) EXAMINED	<u>(8) cross tubes</u>				

JOB DESCRIPTION	PROCEDURE NO.	LT <u>002</u>	REV./DATE	<u>2008</u>	TECHNIQUE NO.	LT <u>002</u>	REV./DATE	<u>2008</u>	
PART NO.	<u>SEE RESULTS</u>			MATERIAL	<u>AluminuM</u>			THICKNESS	<u>Various</u>
SCOPE	<u>A WEST FLUORESCENT LIQUID PENETRANT INSPECTOR AS</u> <u>USED AND WORKS EXCELLENT</u>								
TEST DETAILS									
METHOD	<input checked="" type="checkbox"/> FLUORESCENT	<input type="checkbox"/> VISIBLE	<input type="checkbox"/> WATER WASH	<input type="checkbox"/> SOLVENT REMOVABLE	<input type="checkbox"/> POST EMULSIFIED				
FAMILY BRAND	<u>WADDELL</u>		BLACK LIGHT S/N	<u>16459</u>	<input type="checkbox"/> OUTPUT > 1000 μ W/cm ²	<input type="checkbox"/> AMBIENT < 2 fc			
PENETRANT	<u>2103</u>	MINIMUM Dwell TIME	<u>>10</u> MIN.	LIGHTING EQUIP.	<input type="checkbox"/> FLASHLIGHT	<input type="checkbox"/> TROUBLELIGHT	<input type="checkbox"/> OUT	<u>100 fc @ SURFACE</u>	
PENETRANT REMOVER	<u>120</u>	MINIMUM DRY TIME	<u>>10</u> MIN.	OTHER	<u>LABINO</u>				
DEVELOPER	<u>SH 052</u>	MINIMUM Dwell TIME	<u>10</u> MIN.	LIGHT METER S/N	<u>1098866</u>				
DEVELOPER TYPE	<input type="checkbox"/> NON AQUEOUS	<input checked="" type="checkbox"/> AQUEOUS	<input type="checkbox"/> DRY	CAL DUE DATE	<u>FEB 27-2012</u>				

TEST SURFACE								
SURFACE CONDITION	<input type="checkbox"/> AS GROUND	<input type="checkbox"/> AS WELDED	<input type="checkbox"/> MACHINED	<input type="checkbox"/> SHOT BLASTED	<input checked="" type="checkbox"/> CLEAN BARE METAL			
SURFACE TEMPERATURE	<input type="checkbox"/> < -4°C/20°F <input type="checkbox"/> -4°C/20°F TO 10°C/50°F <input checked="" type="checkbox"/> 10°C/50°F TO 52°C/125°F <input type="checkbox"/> > 52°C/125°F							

RESULTS - <input checked="" type="checkbox"/> METRIC <input type="checkbox"/> IMPERIAL																																
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; padding: 5px;">1</td> <td style="width: 33%; padding: 5px;">CROSS TUBE D.O. # 75949</td> <td style="width: 33%; padding: 5px;">1</td> </tr> <tr> <td>1</td> <td>CROSS TUBE D.O. # 75948</td> <td>1</td> </tr> <tr> <td>1</td> <td>CROSS TUBE D.O. # 79388</td> <td>1</td> </tr> <tr> <td>1</td> <td>CROSS TUBE D.O. # 79387</td> <td>1</td> </tr> <tr> <td>1</td> <td>CROSS TUBE D.O. # 80135</td> <td>1</td> </tr> <tr> <td>1</td> <td>CROSS TUBE D.O. # 80134</td> <td>1</td> </tr> <tr> <td>1</td> <td>CROSS TUBE D.O. # 79333</td> <td>1</td> </tr> <tr> <td>1</td> <td>CROSS TUBE D.O. # 79337</td> <td>1</td> </tr> </table>									1	CROSS TUBE D.O. # 75949	1	1	CROSS TUBE D.O. # 75948	1	1	CROSS TUBE D.O. # 79388	1	1	CROSS TUBE D.O. # 79387	1	1	CROSS TUBE D.O. # 80135	1	1	CROSS TUBE D.O. # 80134	1	1	CROSS TUBE D.O. # 79333	1	1	CROSS TUBE D.O. # 79337	1
1	CROSS TUBE D.O. # 75949	1																														
1	CROSS TUBE D.O. # 75948	1																														
1	CROSS TUBE D.O. # 79388	1																														
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1	CROSS TUBE D.O. # 80135	1																														
1	CROSS TUBE D.O. # 80134	1																														
1	CROSS TUBE D.O. # 79333	1																														
1	CROSS TUBE D.O. # 79337	1																														
<i>Lead Indication</i> <i>3/26/02</i>																																

Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES

CLIENT REPRESENTATIVE	<u>Andrew Sheldon</u>	SIGNATURE	DTR #	<u>E 63814</u>
TECHNICIAN (SIGNATURE):	<u>Sheldon</u>			REPORT
NAME (PRINT):	<u>Andrew Sheldon</u>	2ND TECHNICIAN	REVIEWED BY:	
TECHNICIAN		2ND TECHNICIAN	NAME	INITIALS
CGSB LEVEL	<u>E</u>	SNT LEVEL		
CGSB REG. NO.	<u>6606</u>			CGSB REG. NO.

WHITE - CLIENT COPY

CANARY - OFFICE COPY

PINK - TECHNICIAN COPY

GOLD - OFFICE COPY